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Exceptionally preserved specimens of
Portunus monspeliensis (A. Milne Edwards, 1860)
(Brachyura, Portunidae)
from the Miocene of Sardinia (Italy)

Abstract - Some specimens of *Portunus monspeliensis* (A. Milne Edwards, 1860) (Brachyura, Portunidae) from the middle Miocene (Langhian) of Binu Mancu (Oristano, Sardinia) have very well-preserved cuticle, occasionally with traces of the original pigmentation. The collection also comprises an albinotic individual.

Key words: Decapoda, Portunidae, Miocene, Sardinia, preservation, albinism.

Riassunto - Conservazione eccezionale in alcuni esemplari di *Portunus monspeliensis* (A. Milne Edwards, 1860) del Miocene della Sardegna (Italia).

Vengono descritti ed illustrati alcuni esemplari di *Portunus monspeliensis* (A. Milne Edwards, 1860) (Brachyura, Portunidae) provenienti dal Miocene medio (Langhiano) di Binu Mancu (Oristano, Sardegna). Gli esemplari hanno la cuticola conservata molto bene e talora presentano tracce dell'originale pigmentazione. Tra il materiale esaminato è presente un individuo di colorazione albina.

Parole chiave: Decapoda, Portunidae, Miocene, Sardegna, conservazione, albinismo.

Introduction

Cenozoic decapods from Sardinia have a long history of study, for instance Meneghini (1857), A. Milne Edwards (1860), Mariani & Parona (1887), Parona (1887), Ristori (1886, 1888), Lovisato (1902), Lörenthey (1909), Comaschi Caria (1950, 1956), Marras & Ventura (1991), and De Angeli & Marangon (1992). The specimens studied come from marly limestones or calcareous marls of Oligocene, Miocene, and Pliocene age (De Angeli & Garassino, 2006b).

The known species are: *Callianassa calaritana* Ristori, 1896; *C. desmarestiana* A. Milne Edwards, 1860; *C. pedemontana* Crema, 1895; *C. cf. rakosiensis*

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Lörenthey, 1898; *C. subterranea* (Montagu, 1808); *Callianassa* sp. (Superfamily Callianassoidea Dana, 1852); *Galathea affinis* Ristori, 1886 (Superfamily Galattheoidea Samouelle, 1819); *Dardanus mediterraneus* (Lörenthey, 1909); *Pagurus manzoni* (Ristori, 1888); *Pagurus* cf. *substriatus* A. Milne Edwards, 1861; *Pagurus* sp. (Superfamily Paguroidea Latreille, 1802); *Calappa* sp. indet.; *Mur-siopsis?* sp. indet.? (Superfamily Calappoidea A. Milne Edwards, 1837); *Ebalia lamarmorai* Lörenthey, 1909; *Hepatinulus lovisatoi* Lörenthey, 1909 (Superfamily Leucosioidea Samouelle, 1819); *Maja miocaenica* Lörenthey, 1907; *M. squinado* (Herbst, 1788) (Superfamily Majoidea Samouelle, 1819); *Lobocarcinus sismondai* (von Meyer, 1843) (Superfamily Cancroidea Latreille, 1802); *Portunus monspeliensis* (A. Milne Edwards, 1860); *P. neogenicus* Müller, 1979; *P. hastatus* (Linnaeus, 1767); *Necronectes schafferi* Glaessner, 1929 (Superfamily Portunoidea Rafinesque-Schmaltz, 1815); *Xantho moldavicus* (Yanakevich, 1977), ?*X. lovisatoi* (Lörenthey, 1907); and *Goneplax gulderi* Bachmayer, 1953 (Superfamily Xanthoidea MacLeay, 1838). The specimen of *Phlyctenodes irregularis* described by Ristori (1896) could be ascribed to *Daira speciosa* (Reuss, 1871) (De Angeli & Garassino, 2006b).

Portunus monspeliensis is common in middle Miocene strata of Sardinia and it has been reported from Cagliari (Monte S. Michele and Fangario), Oristano (Pianu, Magomadas, Flussio, and Tresnuraghes), and Sassari (Bonorva) by several authors but under different, synonymous, names: *Lupa hastata* Linnaeus, 1767; *Neptunus convexus* Ristori, 1888; and *N. granulatus* (A. Milne Edwards, 1860) (see Comaschi Caria, 1956).

This species is also known from the Miocene of Lecce (Puglia), S. Maria Vigliana (Emilia-Romagna), and Meduno (Friuli-Venezia Giulia) (Ristori, 1888; De Angeli & Garassino, 2006a). The record of *P. monspeliensis* from the Rupelian (lower Oligocene) of Bacino Ligure Piemontese is dubious. In fact, Allasinaz (1987) pointed out that specimens assigned to this species, discovered in Piedmont, could belong to a different subspecies of *P. monspeliensis*. Finally, this species has been also reported from Malta, Spain, Portugal, France, Hungary, Austria, Egypt, and the Sinai Peninsula (A. Milne Edwards, 1860; Ristori, 1888; Glaessner, 1928, 1933; Lörenthey & Beurlen, 1929; Müller, 1979, 1984, 1993; Gatt, 2006). The descriptions and illustrations of this species usually refer to carapaces lacking exocuticle, and therefore the dorsal surface does not demonstrate the original ornament. Instead, small, ovoid, weakly raised tubercles typically are present on the outer part of the endocuticle.

The specimens from the marly limestone of the Langhian (middle Miocene) of Binu Mancu (the area between the villages of Flussio-Tresnuraghes-Magomadas) are exceptionally preserved and provide new data to our knowledge of this species (Fig. 1).

Material

Twelve specimens from the middle Miocene of Binu Mancu (Oristano, Sardinia) are housed in the Museo di Storia Naturale di Milano (MSNM). They are preserved three-dimensionally and their preparation was easy on account of the softness of the matrix.

The systematic arrangement used in this paper follows the recent classification proposed by Martin & Davis (2001).

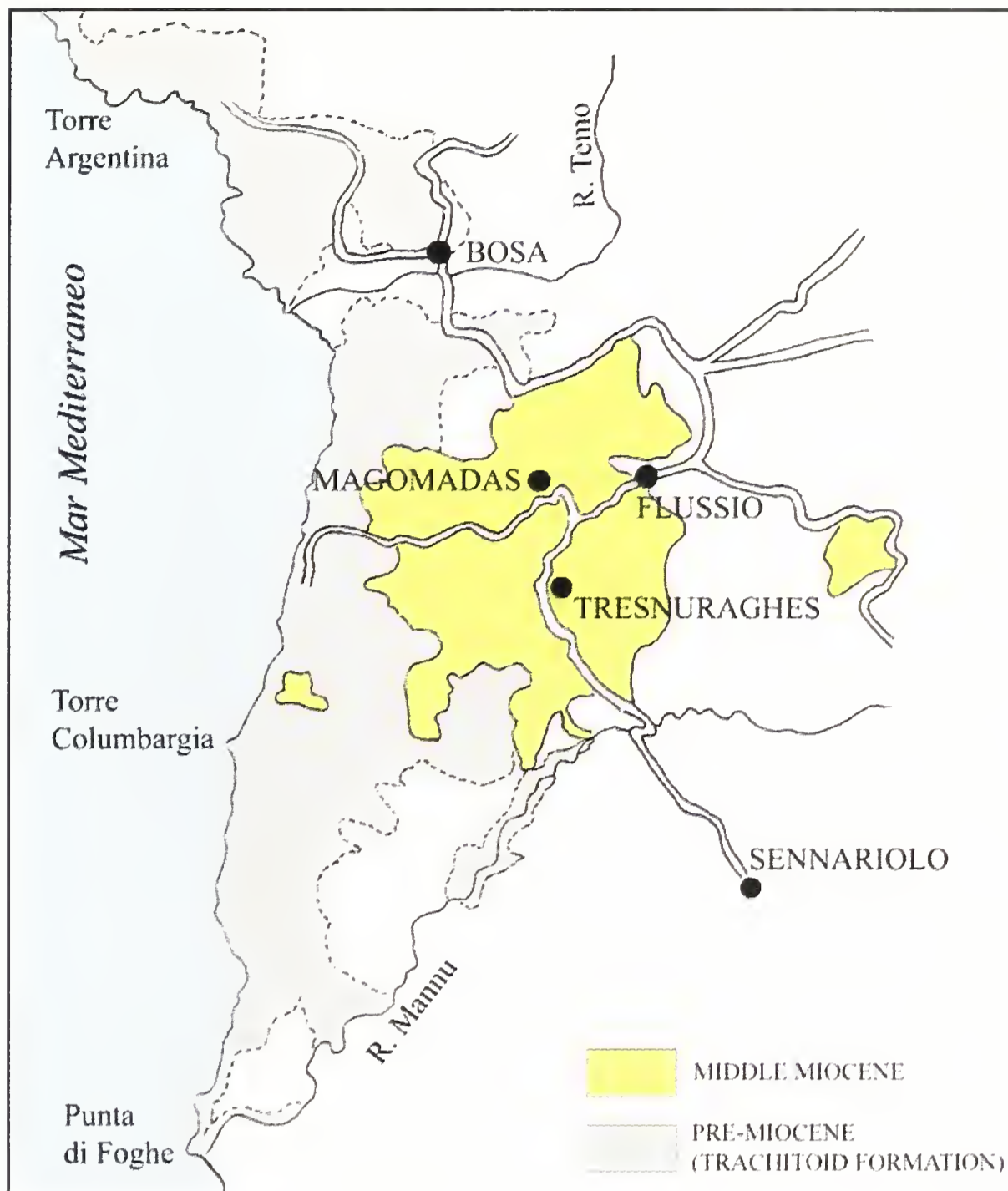


Fig. 1 - Geographical map of western Sardinia with the extent of the outcrop of middle Miocene strata and the provenance area of the material studied. / Carta geografica della Sardegna occidentale con gli affioramenti del Miocene medio da cui proviene il materiale studiato.

Systematic Palaeontology

Infraorder Brachyura Latreille, 1802
 Subsection Heterotremata Guinot, 1977
 Superfamily Portunoidea Rafinesque-Schmaltz, 1815
 Family Portunidae Rafinesque-Schmaltz, 1815
 Genus *Portunus* Weber, 1795

Type species: *Cancer pelagicus* Linnaeus, 1758.

Portunus monspeliensis (A. Milne Edwards, 1860)
 Figs. 2-4

1860 – *Neptunus monspeliensis* A. Milne Edwards; p. 106, Pl. 4 (fig. 1), Pl. 5 (fig. 1)

- 1860 – *Neptunus granulatus* A. Milne Edwards; p. 115, Pl. 3 (fig. 1), Pl. 7 (fig. 2)
- 1888 – *Neptunus granulatus* A. Milne Edwards in Ristori; p. 215, Pl. 4 (figs. 5-11)
- 1893 – *Neptunus granulatus* A. Milne Edwards in Bittner; p. 11
- 1897 – *Neptunus monspeliensis* A. Milne Edwards in Roman; p. 128
- 1898 – *Neptunus granulatus* A. Milne Edwards in Lörenthey; p. 92, Pl. 9 (figs. 2-3)
- 1901 – *Neptunus granulatus* A. Milne Edwards in Blanckenhorn; p. 76, 112
- 1909 – *Neptunus granulatus* A. Milne Edwards in Lörenthey; p. 242, Pl. 2 (figs. 1-2)
- 1911 – *Neptunus granulatus* A. Milne Edwards in Toula; p. 48, Text-figs. 1-2
- 1927 – *Neptunus granulatus* A. Milne Edwards in Van Straelen; p. 86
- 1928 – *Neptunus granulatus* A. Milne Edwards in Glaessner; p. 183
- 1929 – *Neptunus granulatus* A. Milne Edwards in Glaessner; p. 267
- 1929 – *Neptunus granulatus* A. Milne Edwards in Lörenthey & Beurlen; p. 188, Pl. 13 (figs. 3-4), Pl. 14 (figs. 1-4)
- 1950 – *Neptunus granulatus* A. Milne Edwards in Comaschi Caria; p. 326
- 1956 – *Neptunus granulatus* A. Milne Edwards in Comaschi Caria; p. 288, Pl. 1 (figs. 1-7), Pl. 2 (figs. 1-6), Pl. 3 (figs. 1-2)
- 1962 – *Neptunus granulatus* A. Milne Edwards in Zbyszewski & Da Veiga Ferreira; p. 286
- 1964-65 – *Neptunus granulatus* A. Milne Edwards in Da Veiga Ferrera; p. 150
- 1965 – *Neptunus granulatus* A. Milne Edwards in Varola; p. 296
- 1968 – *Neptunus* cfr. *N. granulatus* A. Milne Edwards in Stancu & Andreescu; p. 466, Pl. 7 (fig. 85)
- 1979 – *Portunus monspeliensis* (A. Milne Edwards) in Müller; p. 274, 280, 288, Pl. 18
- 1979 – *Portunus granulatus* A. Milne Edwards in Förster; p. 94
- 1984 – *Portunus monspeliensis* (A. Milne Edwards) in Müller; p. 79, Pl. 62 (figs. 1-2)
- 1987 – *Portunus monspeliensis* (A. Milne Edwards) in Allasinaz; p. 539, Pl. 4 (figs. 1-2)
- 1991 – *Portunus monspeliensis* (A. Milne Edwards) in Marras & Ventura; p. 108, Pl. 1, Pl. 2 (figs. 1-4), Pl. 3 (figs. 1-3)
- 1993 – *Portunus monspeliensis* (A. Milne Edwards) in Müller; p. 14, figs. 6G, 7A
- 2006a – *Portunus monspeliensis* (A. Milne Edwards) in De Angeli & Garassino; p. 283, fig. 8
- 2006b – *Portunus monspeliensis* (A. Milne Edwards) in De Angeli & Garassino; p. 59
- 2007 – *Portunus monspeliensis* (A. Milne Edwards) in Marangon & De Angeli; p. 70

Stratigraphic range: middle Miocene (Langhian).

Type locality: Binu Mancu (Oristano, Sardinia).

Occurrence: Twelve complete specimens ten of which show the dorsal surface (MSNM i26874, i26875, i26877, i26878, i26918-i26921, i26922, i26923), two the ventral surface (MSNM i26876, i26924).



A



B



C

Fig. 2 – *Portunus monspeliensis* (A. Milne Edwards, 1860), n. cat. MSNM i26874. A) carapace in dorsal view (carapace in norma dorsale) (x 1.6). B) close-up of dorsal coloration (particolare della colorazione dorsale) (x 2.5). C) right cheliped (chelipede destro) (x 1.8).

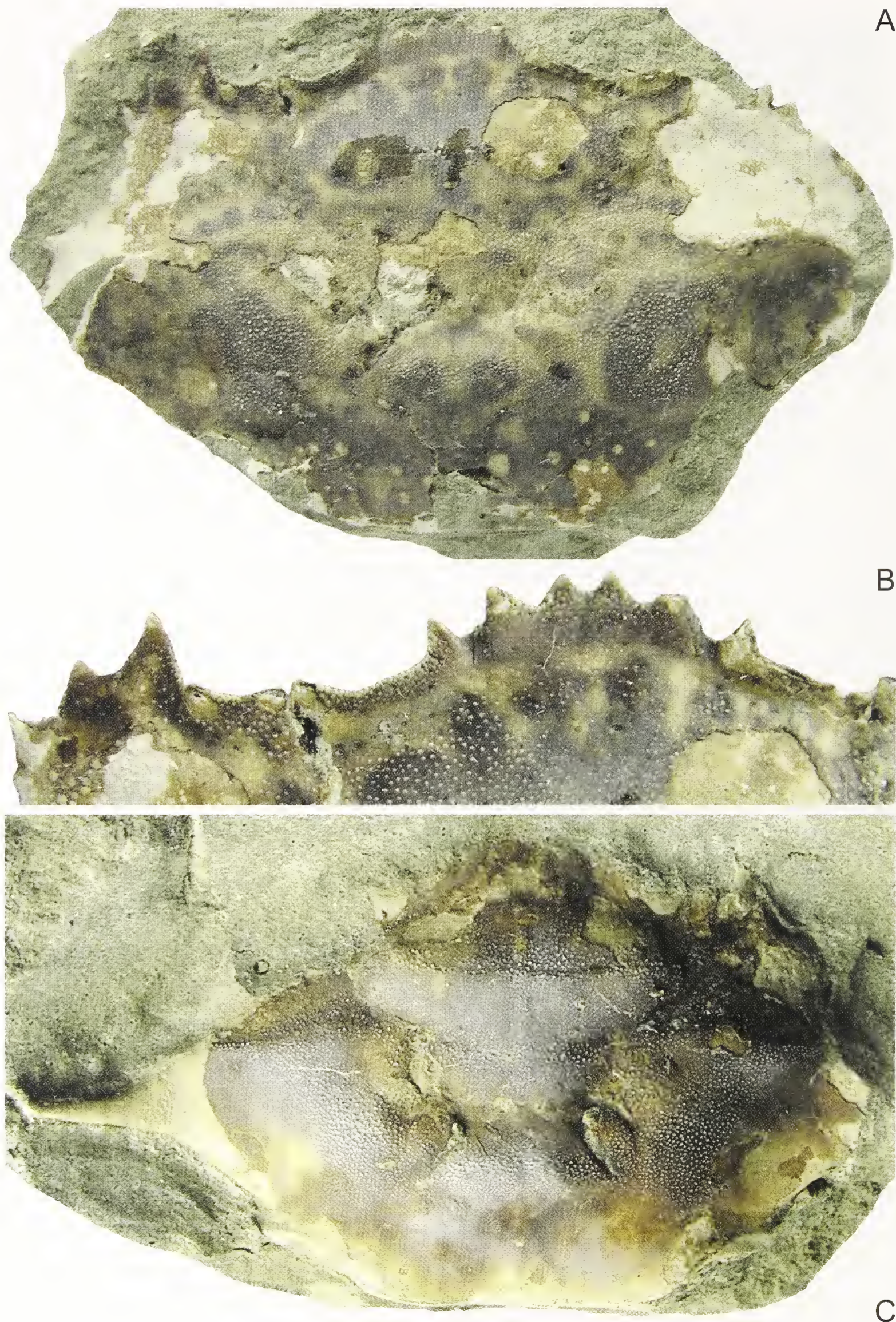


Fig. 3 – A-B) *Portunus monspeliensis* (A. Milne Edwards, 1860), n. cat. MSNM i26875. A) carapace in dorsal view (carapace in norma dorsale) (x 1.5). B) orbito-frontal margin (margine orbito-frontale) (x 2.5). C) *Portunus monspeliensis* (A. Milne Edwards, 1860), n. cat. MSNM i26878, carapace in dorsal view (carapace in norma dorsale) (x 1.5).



A



B

Fig. 4 – A) *Portunus monspeliensis* (A. Milne Edwards, 1860), n. cat. MSNM i26876, ventral view, female individual (visione ventrale, individuo femminile) (x 1.1). B) *Portunus monspeliensis* (A. Milne Edwards, 1860), n. cat. MSNM i26877, carapace in dorsal view (carapace in norma dorsale) (x 1).

Discussion. These specimens show the following morphological characters: original dorsal ornament; exocuticle with fine granulation, denser on metagastric, cardiac, and branchial regions; elongate supraorbital margin, interrupted by two narrow and finely granulate fissures (Fig. 3 A-B); extraorbital spine more strongly developed than the other seven spines along lateral margin; anterolateral spines decrease in size (excluding the elongate spine located on the angle); small granules also present on margins of the lateral spines; protogastric regions with transverse granulated crista; epibranchial regions crossed by a sinuous, granulated and transverse crest also extending onto the elongate spine of the anterolateral angle; posterolateral margin concave and with superficial granulated crest; sternite IV with transverse concavity and finely granulated anterior lateral margin (Fig. 4 A). The exocuticle of the carapace, chelipeds, sternites, and abdomen is always of a brown-purple colour (Fig. 3 A-C); many small white-yellowish areas are present on chelipeds and carapace surface (Fig. 2 A-C). These areas are larger on the posterior part of the dorsal surface and smaller and more uniform elsewhere. The carapace is brown-purple in colour and the areas are reduced or absent in other specimens. One specimen has a white exocuticle and brown-purple chelipeds with small white-yellowish areas (Fig. 4 B). The pigmentation of *P. monspeliensis* is similar to that of some Recent portunids along the American coasts [e.g. *Arenaeus cribrarius* (Lamarck, 1818), *Arenaeus mexicanus* (Gerstaecker, 1856)] which exhibit a carapace of grey or brown colour with small yellow or white areas. The fossil specimen with a white carapace (Fig. 4 B) may be a case of albinism. Previously, Rathbun (1930: 104) recorded occasional examples of albinism in *Callinectes sapidus* Rathbun, 1896.

The new specimens of *P. monspeliensis* from the Miocene of Sardinia constitute a unique data set in the fossil record in view of their retaining pigmentation, allowing documentation of variations in colour pattern within the same species.

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